Eco-school evaluation beyond labels : the impact of environmental policy, didactics and nature at school on student outcomes

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Abstract

We present results from a large-scale study in Flanders, focusing on the effectiveness of eco-schools. We surveyed 2152 students and 1374 teachers in 101 primary and secondary schools actively engaged in the program at different stages (including control schools), focusing on their environmental values, knowledge and motivation. The results show that as schools progress in becoming a certified eco-school, students' environmental outcomes change; the eco-schools project thus clearly has an educational impact. The main effects are observed for theoretical knowledge, and to a lesser extent, applied knowledge. We also observed a drop in utilization values and in amotivation. On the other hand, the controlled motivation of students is stimulated by the project, suggesting that students act pro-environmentally due to external pressures rather than because of intrinsic reasons. We also explicitly moved beyond comparing schools based on eco-schools labels and studied the process factors that contribute to learning outcomes. Our results highlight the importance of the approach to didactics for environmental education, the making of environmental education policy in the schools, and the presence and use of natural green elements at the school campuses. For each of these school-level variables, the impact on students' environmental learning outcomes are studied and discussed.

Key words

Environmental values, environmental knowledge, environmental motivation, eco-schools, impact

Introduction

Environmental education (EE) is seen by many as one of the keys to addressing the current environmental crisis. Countless EE initiatives are implemented across the globe; such initiatives often address the environmentalism of young people, aiming to build their capacity to make important choices, while considering and acknowledging the impact of their own behavior on the natural environment (Hungerford & Volk, 1990; Tilbury, 1995). Initiatives differ in the goals they set out to achieve, in their target groups and in their didactical approach. Given the importance of EE, it is crucial that efforts in this field are effective and that evaluation research is set up to study, confirm or, if necessary, improve the impact of EE initiatives (Boeve-de Pauw, 2014). The current Flemish study zooms in on the effects of the largest and most widely implemented EE initiative within formal education: the eco-schools project.

Eco-schools in Flanders

The eco-schools project is an international umbrella program operated under the auspices of the Foundation for Environmental Education (FEE), and it is implemented in countries all over the world. The

FEE defines the eco-schools project as: “a fundamental initiative which encourages young people to engage in their environment by allowing them the opportunity to actively protect it” (FEE, 2016). It is a certification program within which schools can earn a ‘green flag’, based on external evaluation. Overall, the project aims to improve the environment through direct and indirect effects. Direct effects are those that can be labeled as, for example, increased biodiversity on campus, more recycling or more waste prevention, more energy efficient solutions in schools, etc. Indirect effects are those that are realized through the impact that the project has on the students: an increase in their environmental attitudes, better decision making skills, more motivation to make a difference, etc.

Boeve-de Pauw and Van Petegem (2011) reported that in about 50 countries the eco-schools project has been implemented in schools. More than 30,000 schools are actively engaged in the eco-schools project, reaching over 600,000 teachers and 9,000,000 students. The implementation of the project differs between countries: while in some cases an NGO serves as national operator, in others it is the government. While in all countries the goal of being awarded the green flag as a certificate of excellence is shared, the road towards that flag can differ extensively. In Flanders (the Dutch speaking community of Belgium), obtaining a green flag is a lengthy and immersive process that schools go through over a timeframe of up to ten years. The Flemish eco-school project has installed an elaborate system of certification: schools work on their EE quality by paying attention to the following criteria: vision and planning, student participation, support, communication and structural embedding (Department of the Environment, Nature and Energy, 2015). As such, an eco-school purposefully aims for both direct and indirect effects. As recognition for their work, Flemish schools can earn logos, awarded by the Flemish Government. These logos are a three-step quality label: logo 1, logo 2 and logo 3. It is the school itself that determines the pace at which it wants to earn the three logos. A school can only apply for a single logo per academic year, and there is no explicit need to obtain all the logos in three consecutive years.

The Flemish eco-schools project also encourages schools to maintain their efforts, even after they have obtained the third logo, so that they can apply for the FEE green flag. There is a logo commission in every Flemish province and in the Brussels-Capital Region. These commissions include eco-school coaches, the eco-schools coordination team, pedagogical counselors (from the educational bodies), the educational inspectorate and members of the provincial environmental education services. On the basis a portfolio-of-proof that schools submit, these commissions determine whether a school is accredited a logo. In July 2014, 2,910 primary schools and 1,009 secondary schools in Flanders had committed themselves to the eco-schools project (of which, 1,567 and 596 had an eco-schools logo, respectively) (Boeve-de Pauw & Van Petegem, 2013).

It is clear that the eco-schools project offers a huge potential to make a difference, both locally in Flanders and internationally. It is the largest environmental education program in the world and it offers a framework within which schools from all over the globe can actively get involved. A growing number of researchers are addressing their scholarly attention to the educational effects of the project, in an effort to grasp its educational outcomes and the processes that lead to them.

Educational outcomes – it is not just about behavior

It is important to note that the eco-schools project does not aim to overtly change the behavior of students. The project does not explicitly adhere to behavioristic models. Such an outlook on behavior sees a straightforward connection between knowledge, attitudes and behavior (Robottom & Hart, 1995). Even though contemporary theoretical models put forward that knowledge is not the basis of behavior, or of attitudes, studies, such of that of Krnel & Naglic (2009) have revealed that behavioristic conceptions are often still very present in the minds of EE practitioners and teachers. A recent study by Beeckman, Dierckx, Granatcher, Jacobs & Jansen (2013) showed that when Flemish eco-school teachers are asked to talk about the causation of environmental behaviour, the model that is at the top of their minds is the one knowledge-attitudes-behavior model. There are many (competing) contemporary models on the causation of behavior (e.g., the theory of planned behavior, Fishbein & Azjen, 1975; or the values-beliefs-norms model, Stern, 2000, and recently, the stage models, Bamberg, 2013). Without going into detail on these models, what can be argued as their common ground is that values are often theorized as crucial preconditions of behavior, and that behavior is closely related to motivation (Legault & Pelletier, 2000).

The current study focusses on the values, motivation and knowledge as learning outcomes of the eco-schools project. We focus on these specific outcomes, since they are presented in a diverse range of literature on the effects of environmental education. In addition, they were identified as intended learning outcomes of the project in Flanders in earlier research. As reported in Boeve-de Pauw & Van Petegem (2013) we organized several focus group discussions with the eco-school coaches in Flanders. These coaches support schools in the implementation of environmental education, and, the results identified the range of outcomes, which were used in the current study.

A widely applied model for measuring *environmental values* is that of Bogner and Wiseman (2006). The two major environmental values (2-MEV) model describes two independent value dimensions: preservation and utilization. While the first is related to eco-centric notions and puts forward the preservation of natural resources, the second is related more to an anthropocentric outlook and focuses on the use and exploitation of the natural environment. Essential to the 2-MEV, is that preservation and utilization values are not mutually exclusive, but rather independent dimensions, within the same model. As Milfont (2010) pointed out, allowing for such a set of integrated values is in line with the contemporary debate on the psychology of sustainable development. Research has shown that preservation and utilization values relate differently to environmental behavior. Milfont and Duckit (2010) and Boeve-de Pauw & Van Petegem (2011) have shown that while preservation values are positively related to environmental behavior, utilization values are only lightly negatively, or not at all related to such behavior. Increased preservation and, to a lesser extent, a decrease in utilization values can thus be considered as desirable or positive outcomes of EE.

De Young introduced *environmental motivation,* or the motivation to do something for the environment to the field in 1986.. Legault and Pelletier (2000) translated the concept to the context of students and developed an instrument to measure the impact of educational initiatives in terms of changes in their motivation. The Motivation Towards the Environment Scale (MTES; Pelletier, Tuson, Green-Demers & Noels, 1998) is based on the self-determination theory of Deci and Ryan (1985). To summarize, this theory considers behavior as caused by motives reflecting different degrees of self-determination. These

motives can be classified under one of three denominators: autonomous motivation, controlled motivation or amotivation. The first represents the highest degree of self-determination: behavior is performed for an intrinsic value. At the other end of the spectrum is amotivaton, representing a lack of belief in personal control and alienation from the subject. For environmental problems, this is an often seen barrier to behavior, illustrated by statements such as "how can I as an individual make any difference in huge issues such global climate change?". Controlled motivation reflects motives somewhere between these two poles, and mainly reflects reasons outside the self for performing an action (e.g., because others expect it from you). Overall, the motivational dimensions can be seen as scattered on a continuum of self-determination, and they reflect different levels of engagement in a behavior (De Young, 1996). Motivations reflecting more self-determination can be expected to represent higher engagement, and research has shown that that such motivation is more often observed in people engaged in difficult, complex and time-intensive behavior, such as environmental behavior (Green-Demers, Pelletier & Menard, 1997). Moreover, people with higher levels of self-determined motivation have less need for reinforcement of external sources to engage in behavior in the long run.

Given their importance in the causation of environmental behavior, it is reasonable to adopt values and motivations as desired outcomes of EE initiatives, such as the eco-schools project. Some authors have argued for dropping knowledge as an objective of EE altogether, because time and again research confirms that the association between knowing and doing is very small (Coutenay-Hall & Rogers, 2002). Others, however, argue in favor of a reevaluation and a broader interpretation of knowledge. Research by. Roczen, Kaiser, Bogner and Wilson (2014), for example, shows that in the past, there was a strong emphasis on theoretical knowledge (knowledge about the nature and the environment, which was also labeled 'systems knowledge'), but more recently, applied types of knowledge are also taken into account, such as, the knowledge of the consequences of the choices that you make or of the impact of your own behavior. Such applied knowledge is also referred to as action-related knowledge, effectiveness knowledge or impact knowledge. Theoretical knowledge appears to be less important than applied knowledge to develop environmentalism (Roczen et al., 2014).

What do we know about the effects of the eco-schools project?

Pirrie, Elliot, McConnell and Wilkinson (2006) surveyed Scottish schools that participated in the eco-schools project, focusing on the managerial and educational aspects. One of their aims was to study the perceived educational effectiveness of the project. Students were asked if their school's participation in the project has had an impact on their own environmental concern and behavior. Given the likelihood of social desirability in such questions, the very positive response of the students to this question is to be taken with care. Other studies surveyed the effects of the project on students more directly by comparing the knowledge, attitudes, behavior, and other outcomes between students that were, or were not, in schools that participate in eco-school certification programs. Hallfredsdottir (2011) showed that, while students in Icelandic eco-schools know more about environmental issues, they do not have more positive attitudes. Similar results were seen in the study of Krnel and Naglic (2009) in Slovenia: students in schools that do participate in the eco-schools project know more about the environment than students in schools that do not. However, the certification program did not affect their attitudes and behavior . Boeve-de Pauw and Van Petegem (2011b, 2013) surveyed 50 schools in Flanders and

confirmed the cognitive effect: again, the results suggest an increase in the students' knowledge (and associated values), but not in their attitudes and behavior (and associated values). In recent large-scale studies in Sweden (Olsson, Gericke & Chang-Rundgren, 2015; Berglund, Gericke & Chang-Rundgren, 2014], small positive effects were observed in the sustainability consciousness of students in some certificated schools, but negative effects in others. Overall, the different studies seem to suggest that while school participation in a certification program sometimes results in their students knowing more about the environment, non-cognitive effects are rarely observed. What many of these studies have in common is that they focus only on the outcomes of certification programs, but neglect what is actually happening in the schools.

There are a few studies that go beyond comparing schools with different eco-schools labels. Cincera and Krajhanzl (2013) showed that it is not the schools' participation in the program that will have an impact, but rather the students' participation in the decision-making processes at school. Their results showed that students who report higher participation in such processes also have higher levels of action competence. Cincera and Makova (2011) showed that the lack of effects of the eco-schools program in Czechia is connected to problems with its implementation within the school. A study by Boeve-de Pauw, Gericke, Olsson and Berglund (2015) on Swedish eco-schools also showed the impact of different pedagogical approaches. Students in schools where higher levels of holistic approaches to content are observed are more knowledgeable about sustainability; and students in schools where a more pluralistic pedagogical approach is applied report more frequent sustainability behavior (Boeve-de Pauw et al., 2015).

Moving beyond outcomes

In the current study, we zoom in on the outcomes of the eco-schools project (values, knowledge and motivation), as well as in what is happening in the school and in the classroom. To study the schools' approach to implementing the eco-schools project in Flanders, we used a set of local specific frameworks and measurement instruments (as presented in the methods section).

Studies, such as those of Coertjens et al. (2010), underscore the importance of didactics in terms of impacting on student outcomes through environmental education in schools. Using the PISA 2006 data, these authors showed that students in classrooms that apply more active teaching methods report more positive environmental attitudes and knowledge. Examples of such teaching methods are experiments, excursions, classroom discussions, guest speakers and debates. DiEnno and Hilton (2005) showed that in the case of environmental education, such teaching methods (of didactical approaches) could contribute to achieving cognitive, as well as affective, learning goals. A study by Uitto, Boeve-de Pauw & Saloranta (2015) confirmed that didactics matter; students in schools where teachers indicate that interactive and inquiry based teaching and learning occurs more often have more positive environmental attitudes. Research also points towards experiences in and with nature as a critical success factor in learning for environmentalism. Especially relevant here is the scholarly work that has been done under the label of 'significant life experiences'. Studies have shown that (informal) learning in open air and in natural green places are experiences that can last as lifelong memories and feed an engagement for the environment (Palmer, Suggate, Bajd & Tsaliki, 1998). Brody (2005) confirmed that learning outside the classroom, for

example, in natural settings, can stimulate curiosity and motivation and reorient values. This underscores the opportunity of explaining the differences between students, relating to their environmentalism to the presence and use of nature and green elements in their school.

The successful implementation of the eco-schools project, like that of any innovation in a school, cannot be fully explained by didactics and the presence and use natural elements alone. An especially relevant framework in the context of Flanders is that of the schools' policy-making capacities. This concept was developed specifically in line with the Flemish educational system (see Vanhoof & Van Petegem, 2009), and has (locally) been widely used to describe policies in school relating to a variety of topics (e.g., languages, students well-being etc.). In our current study, we use this framework to explain the differences among the schools' impact on their students' environmental learning outcomes. Vanhoof and Van Petegem (2009) defined policy making capacities as the extent to which schools use the space they have to make policy in a continuous process of sustaining of and changing its functioning, in order to improve the quality of its education and in achieving (imposed and self-set) goals. The concept entails eight different pillars: effective communication, supportive relations, shared leadership, common goals, responsive capacity, innovative capacity, integrated policy and reflective capacity (Van Petegem, Devos, Mahieu, Dang Kim & Warmoes, 2006). A detailed description of each of the pillars can be found in Vanhoof and Van Petegem (2009).

The current study

In the current study, we wanted to explain the differences among students in terms of their environmental knowledge, values and motivation through differences between the schools where those students attend: their participation in the eco-schools project, their didactical approach to dealing with environmental issues, the presence and use of green elements at school, and the making of environmental policy at the school. We propose five closely interconnected research questions:

(1) To what extent are differences between individual students' (grades 6 and 12) outcomes (knowledge, values, motivation) explained by the school they attend?

If schools explain differences among students, or if in other words, schools matter to explain the variation between students in their outcomes, then we can move to the school level to introduce variables that help explain student outcomes. This leads us to the next research question:

(2) What is the effect of the level of the schools' participation in the eco-schools project on their students' (grades 6 and 12) educational outcomes (knowledge, values, motivation)?

This second research question focuses on the effect of the program itself and, thus, follows the logic of explaining the differences in educational outcomes between schools, based on the certifications they have obtained. As argued above, we aimed to move beyond such superficial comparisons. We did this in two ways: firstly, by specifically focusing on the different stages in the project in Flanders (the different logos), rather than using a dummy (0/1) for participation in the project. Furthermore, the next research

questions aimed to expand and explore the focus of eco-school effectiveness research by relating what the students and teachers perceive is happening in the schools, regardless of the schools' certifications:

(3) What is the effect of schools' didactical approach to environmental education on their students' (grades 6 and 12) educational outcomes (knowledge, values, motivation)?
(4) What is the effect of the presence and use of natural elements at school on their students' (grades 6 and 12) educational outcomes (knowledge, values, motivation)?
(5) What is the effect of how the school team creates the environmental education policy at school on their students' (grades 6 and 12) educational outcomes (knowledge, values, motivation)?

Altogether, through answering these research questions, we make two clear contributions to the field. Firstly, we distinguish between the different stages of the eco-schools program, and second, we look beyond the school label and explore the impact of a diversity of school level variables.

Methods

Respondents

The data was collected, within a study commissioned by the Flemish government, in late 2012 and early 2013. In total, 101 schools from all across Flanders were involved in the study, and 3,526 respondents provided data. We applied a purposive two-step data sample, with individual respondents nested within schools. Schools were selected based on their stage in the eco-schools program. Since it was our specific goal to study the differences in educational outcomes of the program across the different stages, we sampled the schools based on their most recently obtained eco-schools logo. The Flemish government (Department of the Environment, Nature and Energy) provided us with a list of schools that participate in the program. We structured the sample in such a way that we would ideally have 10 primary and 10 secondary schools for each of the stages: control, logo 1, logo 2, logo 3, green flag. All schools in the sample had been accredited with their most recent logo in the year before the study. It is important to note that in Flanders, a school's road to achieving the eco-school certifications is very variable. In contrast to other parts of the world, where the certificate can be achieved in a single year, in Flanders it usually takes up to ten years for a school to reach the green flag state. Often, schools will run for a first logo over the course of year, and then take a break of one or more years from active working towards getting the next logo. Thus, large periods of relative inactivity are observed in eco-schools. During these periods, schools might be working on integrating environmental education into policy and procedures, on repeating projects rather than introducing new ones, or even just to keep the project dormant and invest in other priorities that present themselves. Through elaborate contacts with the Flemish Government – which is the national operator for the eco-schools - we obtained the list of "active schools". These are schools that in the year prior to the data collection had obtained, or worked intensively to obtain, a logo. Since our intention was to avoid dormant schools, we purposely drew schools from the list of active schools. We used matching school size and geographic location to select schools at each logo-level, as well as non-eco-schools.

Schools were contacted in September and October 2012, through e-mail and invited to participate in the online survey. Reminders were sent through e-mail and by telephone in follow-up communication. The

respondents completed the surveys from November 2012 through February 2013. In each school, at least one class of students from the last year was invited to complete the online survey during a free moment at school. Furthermore, all teachers from the schools were invited to complete the teacher version of the survey, either during school hours or at home. Table 1 presents an overview of the sample. In primary education, our sample contained data from 1,201 students (grade 6: ages 11-12) and 511 teachers from 56 schools. In secondary education, our sample contained data from 951 students (grade 12: ages 17-18) and 863 teachers from 45 schools.

Table 1. *Numbers of schools at the different stages in the eco-schools program, and number of respondents, cross-tabulated across grades 6 and 12.*

	Grade 6	**Grade 12**	**Total**
Schools			
Control	11	9	20
Logo 1	12	10	22
Logo 2	11	9	20
Logo 3	13	9	21
Green Flag	9	7	16
Total	56	45	101
Respondents			
Students	1201	951	2152
Teachers	511	863	1374
Total	1712	2046	3758

Measures

The student version of the online survey focused on the different educational outcomes. The teacher survey, furthermore, also zoomed in on the processes of the eco-schools project, going into the policy making at school, the use of didactical methods, and the presence and use of green elements at the school. Sample items are provided in Table 2; all psychometric properties are presented in Table 3.

Dependent variables (student level)

Knowledge. We used 11 items to tap into two distinct types of knowledge, as defined by Roczen (2012) and Roczen, Kaiser, Bogner & Wilson (2014). We discerned between theoretical knowledge (system knowledge, 4 items), and applied knowledge (a combination of impact and effectiveness knowledge, 7 items). All items were taken from Roczen (2012) and selected based on the results of her IRT analyses. Specifically, we aimed at a healthy representation of items with diverse difficulties. All items are multiple choices with one or more correct answers out of two, three or four alternatives. Scale scores for both types of knowledge were calculated as the proportion items answered correctly, corrected for their factor weight (see *Analyses)*.

Values. We used the 20-items version of the 2-MEV by Bogner and Wiseman (2006), which has been confirmed as valid and reliable in a Flemish setting (Boeve-de Pauw & Van Petegem, 2011b; 2013). The items differentiate between two independent major environmental values: preservation and utilization.

Each value was tapped by 10 items. We excluded one preservation item based on earlier findings that this specific item was easily misinterpreted by Flemish students (Authors, 2011). The value items were scored on a 5-point Likert-scale, responding to the overall question of how much the respondent agreed with the statements. Possible answers were: (1) strongly disagree, (2) disagree, (3) agree nor disagree, (4) agree, (5) strongly agree. Scale scores for both types of values were calculated as (standardized) factor scores as drawn from a confirmatory factor analysis (see *Analyses)* in which goodness of fit was accepted at RMSEA =< 0.05, CFI >= 0.95, TLI >= 0.95 (Tabachnick & Fidell, 2007).

Motivation. The students' motivation towards the environment was tapped by using the framework of self-determination (Pelletier & Sharp, 2008). The original instrument was developed by Pelletier, Tuson, Green-Demers, Noels and Beaton (1998) and includes six dimensions of motivation. For the purposes of the current study, we used a combination of exploratory and confirmatory factor analytical techniques to reduce the number of dimensions to three: autonomous motivation (8 items), controlled motivation (12 items) and amotivation (4 items). The procedure of this reduction is described in Authors (2016). The motivation items were scored on a 5-point Likert-scale, responding to the overall question of how much the respondent agrees with the statements. Possible answers were: (1) strongly disagree, (2) disagree, (3) agree nor disagree, (4) agree, (5) strongly agree. Scale scores for the three motivation dimensions were calculated as (standardized) factor scores as drawn from a confirmatory factor analysis (see *Analyses)* in which goodness of fit was accepted at RMSEA =< 0.05, CFI >= 0.95, TLI >= 0.95 (Tabachnick & Fidell, 2007). Sample items are provided in Table 2; all psychometric properties are presented in Table 3.

Table 2. *Sample items for the seven student level dependent variables*

Variable	Sample item	Source
Theoretical knowlegde	Why is acid rain bad for trees? A) It destroys leaves, so the trees cannot benefit from photosynthesis anymore B) It destroys minerals in the soil, so the trees have no more food	Roczen (2012)
Applied knowledge	In order to use less energy for heating your house, you can: A) keep the temperature constant B) turn off the heating at night C) isolate windows and doors.	Roczen (2012)
Preservation values	How much do you agree with the following statements? We must set aside areas to protect endangered species	Bogner & Wiseman (2006)
Utilization values	How much do you agree with the following statements? We need to clear forests in order to grow crops	Bogner & Wiseman (2006)
Autonomous motivation	Why would you act in favor of the environment?	Pelletier & Sharp

	Because I find pleasure in mastering new ways to help the environment	(2008)
Controlled motivation	Why would you act in favor of the environment? Because my friend insists that I do so	Pelletier & Sharp (2008)
Amotivation	Why would you act in favor of the environment? I don't know, I have the impression I am wasting my time.	Pelletier & Sharp (2008)

The reliability of each of the five variables (values and motivation) that were tapped through a Likert scale is presented for each of the groups of respondents (students and teachers in grades 6 and 12). All Cronbach's alpha values indicate acceptable to good internal consistency, ranging from 0.678 to 0.835.

Table 3. *Psychometric properties of the seven student level dependent variables*

			Students		Teachers	
Variable	Likert	Items	Grade 6	Grade 12	Grade 6	Grade 12
Theoretical knowlegde	1/0	4	/	/	/	/
Applied knowledge	1/0	4	/	/	/	/
Preservation values	5	9	0.721	0.756	0.736	0.723
Utilization values	5	10	0.702	0.699	0.706	0.689
Autonomous motivation	5	8	0.678	0.701	0.687	0.706
Controlled motivation	5	12	0.734	0.714	0.752	0.751
Amotivation	5	4	0.812	0.835	0.799	0.806

Independent variables

At the individual level, we surveyed the respondents' gender and language spoken at home as explanatory variables. In the analyses, we always used the girls/women as the reference. For the language spoken at home, the 11 most commonly used languages and an open option were offered as alternatives, which were then recoded into a dummy variable identifying 'Dutch' or 'other' (with Dutch being the native language in Flanders, and the official language in Flemish formal education).

Eco-schools. For each respondent, we included a set of dummy variables that indicated whether the school of the respondent was a logo 1, logo 2, logo 3, or green flag school, as opposed to a control school. These dummies allowed us to estimate the difference for each of the logos as compared to the control schools.

Natural elements at school. Respondents were surveyed on their perception regarding the presence and use of natural elements at their school. On a 5-point Likert scale ranging from (1) "none at all" to (5) "very much" they indicated to what extent they: (a) perceived these elements to be present: grass, trees, a forest, shrubberies, corridors, a pond, a vegetable garden, an open field, and "others". Respondents were also asked to what extent they perceived that these elements were used as either: (b) purely decorative; (c) physically (sports and leisure) and (d) pedagogically (a place to learn in or at, and a subject to learn about).

Environmental policy-making. To survey the school's culture surrounding environmental policies, we surveyed the policy-making capacities of all the schools in the sample. The items were only included in the teachers' surveys. The concept of policy making was tapped through a specific Flemish framework that is well known among teachers and school leaders (Vanhoof & Van Petegem, 2009). It included eight pillars that were each tapped through five or six items that can be adapted to the topic at hand; Table 4 presents all eight pillars. In other studies, these have been used to study, for example, language and well-being policies in Flemish schools. Cronbach's alpha showed high internal consistency for all the pillars in grades 6 and 12 teachers. Through the calculation of intra-class correlation coefficients (ICC) using the teacher data, three of the eight pillars were revealed as relevant for the present study (i.e., they showed a significant proportion of variation at the school level): shared leadership, common goals, and supportive relations. Only these three pillars were taken along in the analyses to explain differences among schools in the dependent variables listed above. The teacher data was used to calculate standardized averages for each of the schools and these were then used as explanatory variables (*see Analyses*).

Table 4. The eight pillars of environmental policy making in Flemish schools, including sample items and Cronbach's alphas. * Marks pillars with a meaningful ICC.

Pillar	Items	Sample item: "In this school, we…"	α Grade 6	α Grade 12
Shared leadership*	6	… stimulate each other to participate in the decision making regarding environmental issues	0.814	0.832
Common goals*	6	… agree upon the goals we want to reach regarding the students' environmentalism	0.828	0.831
Integrated policy	6	… know who has which responsibilities regarding environmental issues	0.822	0.819
Reflective capacity	5	… maintain a critical stance regarding their own environmentalism	0.856	0.847
Innovative capacity	6	… know how to avoid resistance when implementing environmental innovations	0.836	0.824
Responsive capacity	6	… respond to societal changes regarding environmental issues	0.842	0.836
Effective communication	6	… communicate openly about motives, ideas, problems and insecurities regarding the implementation of environmental policies	0.799	0.803
Supportive relations*	5	… trust each other when it comes to dealing with environmental issues.	0.888	0.867

Didactical approach. To tap into the didactical EE approach, we included a list of 18 common methods (in Flanders), taken from the study of Kavadias and Dehertogh (2010). The respondents indicated the extent to which, in their perception, each of these didactical methods is used in their school when education deals with environmental issues. The full list of methods can be consulted in

Boeve-de Pauw & Van Petegem (2013). We used the student data to run an EFA; the best fitting factor solution suggested two factors with an eigenvalue greater than 1. Combined, these factors explain 38.16 % of the variation in the data. The first dimension contains methods, such as “debate”, “guest speaker”, “active group assignment”, “year project”, “cross curricular attention”, “trip to a field center”, and was labeled *integrated approach.* The second dimension contains methods, such as “day project”, “clear rules”, “ posters in the hallways”, and was labeled as a *normative approach.* The two dimensions show acceptable reliability, with respective Cronbach’s alpha values of 0.812 and 0.682.

Analyses

We modeled the differences between schools in our sample, concerning students’ knowledge, values and motivation, using multilevel regression models. Since the individual students are not independent from each other (they are clustered within schools), a first step in building the regression models was to estimate the distribution of variance across the different hierarchical levels in the data. To unveil which proportion of the variation between individual students was due to the school within which they were grouped, we tested zero models for each of the dependent variables. When a critical level of an ICC indicating that 4% or more of the variation was present at the school level, we considered the school was a meaningful level to study and explain the differences between students. Given the participation in the eco-schools program is a school-level variable, it is only for those dependent variables that have ICC values above 0.04 that differences can be attributed to the program (or to any school-level explanatory variable). Indeed, when the school was not at a meaningful level in explaining the differences between individual students, then the school level variable could not be shown to contribute to the observed differences between students. Variables for which this threshold was not met can be identified in the results section as having no estimates reported for the school level variable in Table 5.

Once zero models had been established, the next step in fitting the multi-level models was to include explanatory variables. First, we estimated the effects of individual level variables (gender, home language). Even though the current study did not focus on the effects of these individual level variables (e.g., we did not focus on gender differences), we did include them in the models in order to be able to control for their effects and to exclude, for example, gender induced bias. For example, it has been shown (Boeve-de Pauw, Jacobs & Van Petegem, 2012) that girls have more positive environmental values than boys, therefore, not including gender as a control variable might thus lead to gender bias when the genders are not equally distributed across the schools.

The next step then was to include school level explanatory variables. We did this in batches, starting with the dummy identifying the grade (12 vs 6), and then the dummies identifying the level of involvement in the eco-schools program (logos). The effects observed for these dummies represented the difference between schools at a specific point in the program (logo 1, logo 2, logo 3, green flag), as compared to control schools (which are not at all involved in the program). The next batches of explanatory variables were those tapping into the natural elements at school, the policy making and didactical approaches. If any of these variables showed a statistically significant effect on the outcome variables in the model, then it was included in Table 5 (see results). It is important to note here that since we have calculated the scores of the explanatory variables as factor scores, the effects observed are standardized β’s and

can thus be interpreted as effect sizes: 0 to 0.1 represents a very small effect, 0.1 to 0.3 a small effect, 0.3 to 0.5 a moderate effect, and above 0.5 was a large effect. Each of the explanatory variables and interaction terms, with the grade, was estimated, identifying differences in the effect size between students in grades 6 and 12 (with grade 6 of the reference group). Whenever an interaction term was shown to be statistically significant, it was included in the table showing the results of the regression analyses.

Table 5 in the results section also includes estimates of the distribution of variance in the zero model and in the final model, together with the deviance and the degrees of freedom of both the initial and final models The tables in the results section report on the initial and the final models only; results for the steps in between are not shown. We withheld the iteratively built models based on the differences in deviance (-2Log Likelihood) and the degrees of freedom. Only when the models improved statistically, were they withheld.

Results

Table 5 presents the results of the initial and final multilevel regression models. The lower rows of the table show the distribution of variance for each of the dependent variables, and illustrate that schools have the largest impact on the students' theoretical knowledge (they explain 17% of the variation in this variable), their impact is about equal for applied knowledge, utilization values, controlled motivation and amotivation (9.1 to 9.6%). The table also shows that schools explain none of variance in preservation values and autonomous motivation. Given that our sample was purposively drawn to represent the stages in the Flemish eco-school project, this finding suggests that the project has had no impact on students' preservation values and autonomous motivation. For these two dependent variables, we therefore cannot calculate the effects of school level variables, such as logos, policy making, natural elements and didactics. This result answers research question 1.

Table 5.
Summary of the results of the multilevel regression analyses for all dependent variables

	Knowledge		Values		Motivation		
	THEO	APPL	PRES	UTIL	AUTO	CON	AMO
Gender	0.235	0.109	-0.194	0.107	-0.131	0.174	0.201
Home language	-0.126	-0.240	0.142	-0.382	-0.058	/	0.183
Grade 12 (reference is grade 6)	1.449	0.689	-0.325	-0.309	-0.241	-0.289	-0.203
Logo 1 (reference is control)	/	/		-0.095		0.098	-0.100
Logo 2 (reference is control)	0.188	0.062		-0.120		0.093	-0.106
Logo 3 (reference is control)	0.369	0.145		-0.286		0.101	-0.105
Green flag (reference is control)	0.368	0.149		-0.292		0.106	-0.098
Logo 1 * grade 12	/	/		/		0.074	/
Logo 2 * grade 12	0.110	/		/		0.072	/
Logo 3 * grade 12	0.087	0.074		0.051		0.071	/
Green flag * grade 12	0.094	0.074		-0.031		0.089	/
Green: amount	/	/		/		/	/
Green: decorative use	/	/		/		/	/
Green: spatial use	/	/		-0.052		/	/
Green: pedagogical use	/	/		-0.048		-0.068	-0.061

Green: pedagogical use * grade 12	/	/		0.022		/	/
Policy: shared leadership	/	/		/		-0.068	/
Policy: common goals	/	/		/		/	/
Policy: supportive relations	/	/		-0.092		-0.087	/
Policy: supportive rel * grade 12	/	/		0.052		/	/
Didactics: integrated	0.091	0.150		-0.042		-0.061	-0.100
Didactics: normative	0.051	/		0.062		0.072	/
Didactics: normative * grade 12							
zero variance individuals	0.829*	0.901*	1.000	0.901*	1.000	.900*	.899*
final variance individuals	0.759*	0.780*		0.834*		.758*	.782*
zero variance schools	0.171*	0.092*	0.000	0.096*	0.000	.091*	.095*
final variance school	0.053*	0.061*		0.043*		.078*	.081*
R^2 individual level	0.08	0.13		0.07		0.16	0.13
R^2 school level	0.69	0.34		0.56		0.14	0.15
zero deviance	6689.20	6519.87		6854.23		6597.48	6684.69
final deviance	5129.36*	5752.12*		5368.59*		5789.20*	5967*
zero degrees of freedom	3	3		3		3	3
final degrees of freedom	15	13		20		19	13

Effects of participation in the eco-schools project

To answer research question 2, we estimated the effects of the eco-school dummy variables on each of the dependent variables (outcomes). The largest effect of participation in the eco-schools project was that on the students' theoretical knowledge (as shown in Table 5). This effect increases as schools are further along in the project (see Figure 1). The results show that the effects are there for schools that achieved at least their second logo, and that they are larger in grade 12 as compared to grade 6. The effects of applied knowledge show a comparable increase in size, but are overall smaller than those of theoretical knowledge (again, see Figure 1).

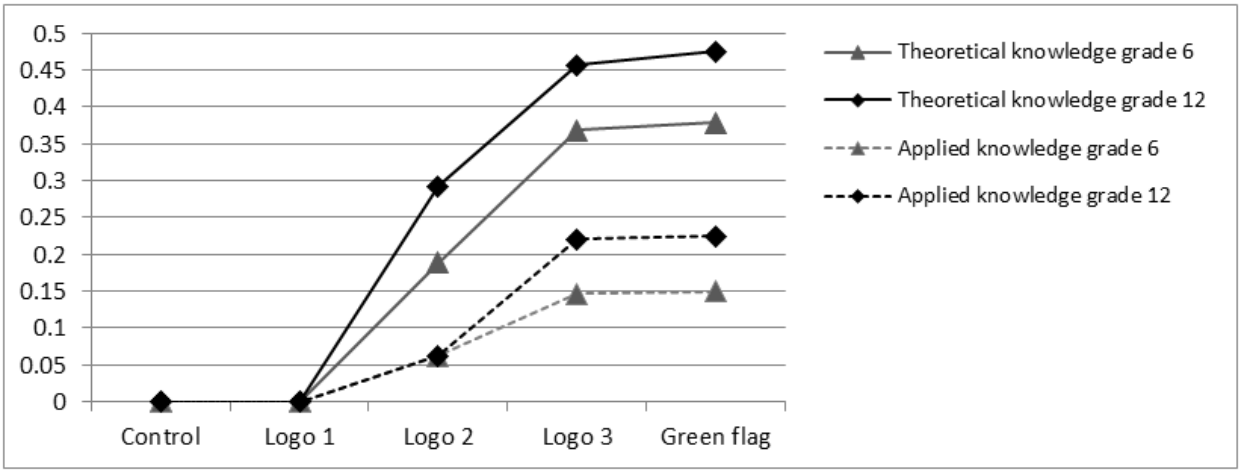

Figure 1. *Effect sizes of school participation in the eco-schools project on students' theoretical and applied knowledge concerning the environment*

While the school is not a meaningful level to explain the differences between students' preservation values (see Table 5), we do see negative effects of schools' participation in the eco-school program on

students' utilization values. These effects gradually increase in size as schools are further along in the project (see Figure 2), and these are larger for students in grade 12 than for students in grade 6. So, our results confirm earlier findings, such as those of Boeve-de Pauw & Van Petegem (2010; 2012), and expand on them by differentiating among the logos. When we look at the results of the analyses with the different motivational variables as dependent outcomes, we see that schools make no difference in the autonomous motivation of their students. We do see important proportions of variation at the school level for controlled motivation and amotivation. The results show that, while school participation in the eco-school project decreases the students' amotivation, it increases their controlled motivation. These effects are equally present in all logo schools, indicating that the effect does not change as schools progress throughout the project. For controlled motivation, the effects are bigger in grade 12 than in grade 6. This difference between the grades was not observed for amotivation (see Figure 3).

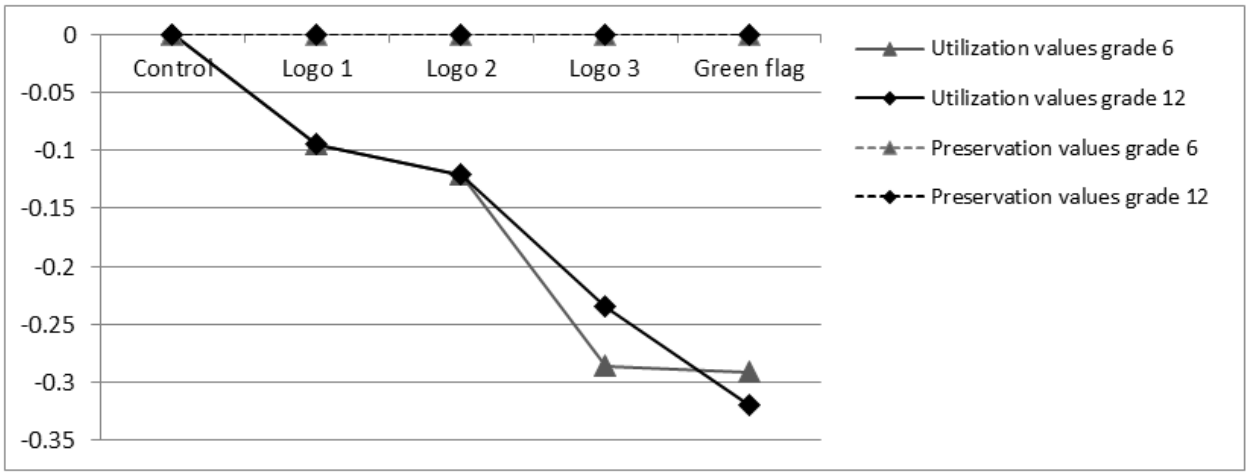

Figure 2. *Effect sizes of school participation in the eco-schools project on students' environmental values*

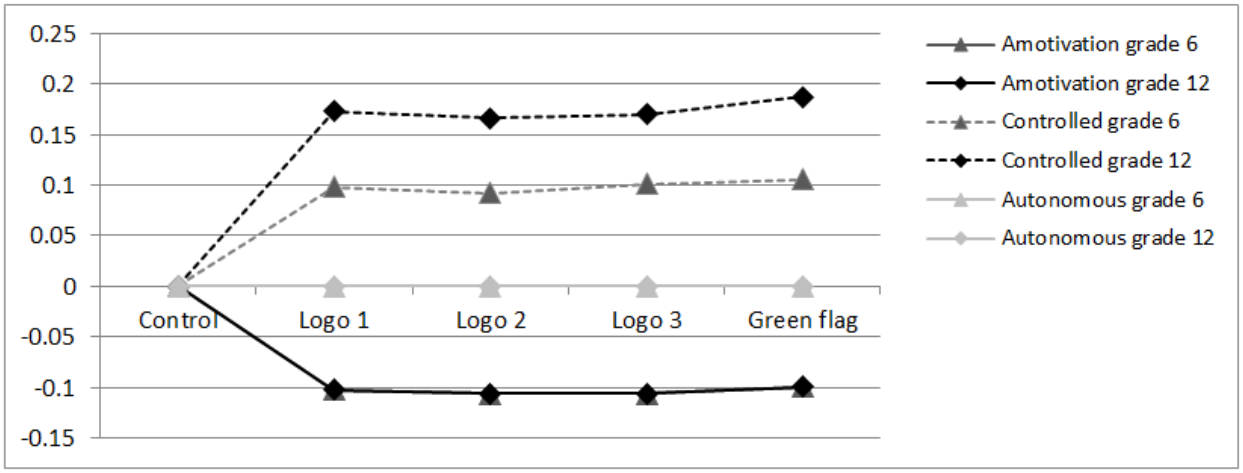

Figure 3. *Effect sizes of school participation in the eco-schools project on students' motivation towards the environment.*

Effects of explanatory school variables

The results shown in Figures 1, 2 and 3 go into the effects of the school's participation (at different stages) in the eco-schools project in Flanders, and thus provide answers to research question 2. We also included process variables that can shed light on the differences between schools, when it comes to their impact on student outcomes (or lack of it), thus addressing research questions 3, 4, and 5. Three main groups of variables were included: (1) the presence and use of natural elements at school, (2) the environmental policymaking at school, and (3) the didactical approach to environmental education. The results in Table 5 show the effects of each of these school levels explanatory variables on each of the dependent variables.

The didactical approach to environmental education was shown to have an effect on all of the dependent variables. Specifically, the integrated didactical approach decreased the students' utilization values, controlled motivation and amotivation while, at the same time, increased both their theoretical and applied knowledge. The largest effect size for the integrated didactical approach was observed for applied knowledge. However, all effects sizes were small to moderate. The effects were equal in size for grades 6 and 12. In summary, these results show that students in schools in which students reported that environmental education was addressed through a more integrated approach scored higher overall on all outcomes on which schools can have an effect in the current study. The normative didactical approach, on the other hand (?), increased the theoretical knowledge of students in grades 6 and 12, but not their applied knowledge. Moreover, this normative increased students' utilization values and the controlled motivation.

The environmental policy making, as reported by the teachers, also showed some effects on the student dependent variables, most notably on their utilization values. In primary schools in which the teachers reported higher supportive relations regarding environmental issues in their school, the students (grade 6) reported lower utilization values and less controlled motivation. The effect was also present in students in grade 12, but was less pronounced. The other two withheld pillars of environmental policy making showed no effects on the students' dependent variables, except for shared leadership, which had a negative effect on the students' controlled motivation. The results also showed that the natural elements at school had an impact. While the mere presence and decorative use of such elements could not be shown to affect the students' knowledge, values or motivation, the way in which they are used did. We observed a small effect of the spatial and pedagogical use of natural elements in terms of lower reported utilization values in students in grades 6 and 12. Moreover, the results showed that in schools in which green elements are to a greater extent used in a pedagogical way, students reported less controlled motivation and less amotivation.

Discussion

The research results presented in studies of different teams (e.g., Olsson et al., 2015; Berglund et al., 2014; Boeve-de Pauw & Van Petegem, 2011; Krnel & Naglic, 2009) put forward a common finding that the main effects of the eco-school project are to be found in relation to knowledge. Students in eco-schools are consistently shown to know more about the environment than students in control schools. Generally, smaller or no effects were observed for attitudinal and behavioral outcomes. The current study aimed to build on what we know about the effectiveness of the eco-schools program in several

concrete ways. Firstly, we did not only include knowledge and values as outcome measures, but also the framework of self-determination: looking into the impact of the project on different forms of motivations towards the environment. Secondly, we did not just compare schools that do with schools that do not participate in the project: we purposefully drew a sample of schools in Flanders at different concrete stages (c.q., the logos) within the project. By selecting schools based on the logos they have obtained, we were able to zoom in on the educational effect of the project in more detail. Finally, we also included other school level variables than just the logos: using local specific (Flemish) frameworks and measurement instruments, we also surveyed the schools' environmental policy making, their didactical approach to EE, and the presence and use of natural elements and infrastructure at the school campus.

The impact of eco-schools

The results of our current study provide answers to our first research questions and confirm the findings reported above that the main effect of the schools' participation in the project is an increase in their students' knowledge. Moreover, as can been seen in Figure 1, the difference between control school students and eco-school students grows as schools are further along in the project. In other words, our current results suggest that students keep gaining more insight as their school progresses through the project. When we look at the differences between the grades, it becomes clear that the biggest effects are observed in secondary education, though the effects in primary education are smaller, they are still statistically significant and meaningful. The results also show that when we look at different kinds of knowledge, the main effects of the project are to be found for theoretical knowledge (or knowledge about the environment). The effects for applied knowledge are consistently smaller for both grades. This suggests that the project does seem to teach students about the environment but to a lesser extent it builds the students' understanding of the impact of their own behavior and the knowledge that it can help them make decisions relating to the environment. We know from the literature (Roczen et al., 2014) that applied knowledge is much more relevant in the causation of pro-environmental behavior. The results can thus be interpreted as a call to action to the teachers to increase the focus on applied knowledge, and not just on theoretical knowledge; to provide students with opportunities to transfer theoretical knowledge into practice. These results also highlight the fact the eco-schools' coaches in Flanders should support schools in creating such opportunities.

The current study also confirms the earlier findings of Boeve-de Pauw & Van Petegem (2011), that the project succeeds in diminishing students' utilization values, but that there is no effect on preservation values. The decrease in utilization values is about equal for students in primary and in secondary schools, and again, seems to build up as schools progress through the project. In contrast to the effects observed for knowledge and utilization values, the effects of the project on the students' motivation did not change as schools progress through the project. This seems to suggest that the impact of the project on the students' motivation is there from the start and is a constant throughout the implementation of the project. While the students' (both in grades 6 and 12) amotivation is lower in eco-schools (at any stage) as compared to students in control school, we observed no effects for autonomous motivation. The students' controlled motivation was impacted on positively (stronger in grade 12 than in grade 6). These results suggest that, while the project does seem to tackle the students' amotivation, it does not

autonomously motivate them towards the environment. Rather, it instills in them the need for an external source of pressure to adopt pro-environmental behavior.

As is shown earlier, research has identified patterns in the interconnections between the different outcomes variables that were included in the present and in previous studies. On the one hand, knowledge (and especially theoretical knowledge), utilization attitudes and controlled motivation appear to go together, but have only a small, or no effect on environmental behavior; on the other hand, preservation values and autonomous motivation go together, with environmental behavior (Milfont & Schultz, 2016). The finding that the eco-schools project especially impacts on the first set of variables is an explanation for why an effect on behavior remains absent (Boeve-de Pauw & Van Petegem, 2013). It turns out that for the eco-schools project, although there are indeed educational benefits, has an overall approach, which results in more knowledge, reduced utilization values and in a stronger controlled motivation. These are exactly the outcomes which are less likely to translate into, or provide, a sound basis for environmental behavior.

A recent study by Beeckman et al. (2013) showed, by means of in-depth interviews, that the views of eco-school coordinators in the schools might be part of the explanation for the observed effects. Indeed they mainly thought in terms of a linear causation of behavior, where knowledge leads to attitudes, which then, in turn, leads to different behavior. Interviewees in that study talked about the goals of the project in terms of "*that the students know how something is done*", "*that they know why something is important*". This is in line with the current results, that the largest educational effects of the eco-schools project are found in terms of knowledge. A consequence of this might be that studentsin eco-schools show no changes in their environmental behavior, in the long run.

What else explains differences?

The address research questions three, four and five, in the second part of the analyses, we examined the connection between these differences in outcomes and a number of process variables. The results of these analyses allowed us to draw up recommendations in order to increase the educational effects of the eco-schools project. Teachers gave their perceptions on the environmental policy-making capacity of their school. Both students and teachers, furthermore, indicated which didactical methods are used in their school with respect to EE. Finally, the research mapped out their perceptions regarding the quantity and the use (purely decorative, spatial or pedagogical) of natural green elements at their school.

We distinguished between the purely decorative use of the green elements, the spatial use (i.e., as a location for sports or as a location for recreation) and the pedagogical use (as teaching material and/or classroom). The spatial and pedagogical use of green elements turned out to reduce the utilization values. The pedagogical use of the green elements that are present also reduced the students' controlled motivation and amotivation in both primary education and secondary education. These results underscore the benefit of being green at the school campus, but also show that a real educational impact can be achieved when the nature that is present is also used in the teaching and learning, and not serves a purely decorative function.

With respect to the teaching methods, the results distinguished between an integrated and a normative approach. It is important to stress here that, just like in the case of policy making capacities, these variables build on local traditions in Flanders. The results show that schools in which the students report differently for the extent to which one of both of these approaches are applied, have different a effect on their students' environmental outcomes, regardless of the schools' participation or stage in the eco-schools project. An integrated approach has a small, but positive, effect on theoretical knowledge, and has a larger effect on applied knowledge and this is in both in primary and secondary education. The integrated approach is thus a way to reinforce the applied environmental knowledge of students. At the same time, the research also shows that this approach tempers the utilization attitudes of students and weakens their controlled motivation and amotivation. The normative approach achieves exactly the opposite: it results in an increase of the theoretical knowledge, not of the applied knowledge, and increases the utilization attitudes of the students, which is an undesired effect. These results clearly suggest that a normative approach should best be avoided and that the focus should go to an integrated approach.

With respect to policy-making capacity, the three of the pillars of policy-making capacity are important, these are 'shared leadership', 'common goals' and 'supportive relations'. The results show that that the policy-making capacity of a school especially has effects on the environmental values of students. Schools where the teachers said that they felt supported by their fellow teachers and the school leader succeed better in decreasing the utilization values of their students. Furthermore, in schools where the teachers reported more share leadership, the students reported less controlled motivation. These results are present regardless of which logo the school had obtained. In that sense, an environmental policy, which requires stronger participation from the teachers and makes it possible for them to fall back on each other and share leadership for the project could be part of the remedy against the increase in controlled motivation that is observed in eco-schools. These results shed light on how schools could effectively implement the eco-schools project and achieve some of the central educational outcomes that pave the way for students to develop their pro-environmental behavior. The results also suggest that eco-school coaches, in their turn, should support schools in developing the named policy-making capacities. In this sense, the results highlight that a key focus for eco-school coaches could be supporting school teams to develop relevant policy-making capacities.

Conclusions

The current study confirmed that the effects of the eco-schools project on students' educational outcomes are mainly cognitive. It also showed that the approach applied by schools in Flanders might not result in an impact on the students' behavior in the long run. Furthermore, the study gives insight into how such an impact might be achieved through policy making, didactics and the use of nature at school. Of course, there are many other factors that might be involved in the successful implementation of the eco-schools project, such as student participation, community involvement, etc. More research into the impact of such factors, and into the extent to which they occur in schools in Flanders and abroad, is a valuable next step.

The current study was cross-sectional in design and, therefore, focussed on the differences between students in different schools, rather than on the changes in those students' outcomes over time. Longitudinal research, focusing on the changes that occur in students as their schools progress through the project, would complement the current findings. Also, research on the long-term impact is needed, especially given the results of the current study regarding the impact of the project on the controlled motivation; research that examines behavior of students with this kind of motivation as they leave school, and as their external sources of motivation change and disappear.

The present study was commissioned by the Department of the Environment, Nature and Energy of the Flemish Government, which is the national operator for the eco-schools project in Flanders. Based on the results of the study, the eco-schools project is currently going through a process of change, focusing (amongst others) on the coaching role of the eco-school coaches that go into the schools to support them and facilitate the implementation. One major decision that was made in line with the effects on controlled motivation was to change the certification system. Flemish schools now no longer have to apply for the different logos with portfolios of proof. The new implementation scenario is currently being developed, and a follow-up study on the effects of the new approach would be valuable once it is fully up an running.

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